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Association between gender confirmation treatments and perceived gender congruence, body image satisfaction and mental health in a cohort of transgender individuals

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Abstract

Background—Transgender individuals sometimes seek gender confirmation treatments (GCTs), including hormone therapy (HT) and/or surgical change of the genitalia and other secondary sex

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characteristics (gender confirmation surgeries; GCS). These treatments, which alter the body so that it is more compatible with one's identity, may ameliorate distress resulting from the incongruence between one's physical appearance and gender identity.

Aim—The aim was to examine the degree to which individuals' body-gender congruence, body image satisfaction, depression and anxiety differed by GCT groups in cohorts of transmasculine (TM) and transfeminine (TF) individuals.

Methods—The "Study of Transition, Outcomes & Gender (STRONG)" is a cohort study of transgender individuals recruited from three XXX health plans located in Georgia, Northern California and Southern California; cohort members were recruited to complete a survey between 2015–2017. Participants were asked about: history of GCTs; body-gender congruence; body image satisfaction; depression; and anxiety. Participants were categorized as having received: 1) no GCT to date; 2) HT only; 3) HT + top surgery; 4) HT + partial bottom surgery; and 5) HT + definitive bottom surgery.

Outcomes—Outcomes of interest included body-gender congruence, body image satisfaction, depression and anxiety.

Results—Of the 2,136 individuals invited to participate, 697 subjects (33%) completed the survey, including 347 TM and 350 TF individuals. The proportion of participants with low body-gender congruence scores was significantly higher in the "no treatment" group (prevalence ratio [PR]=3.96, 95% confidence interval [CI] 2.72–5.75) compared to the "definitive bottom" surgery group. The PR for depression comparing participants who reported no treatment relative to those who had definitive surgery was 1.94 (95% CI: 1.42–2.66); the corresponding PR for anxiety was 4.33 (95% CI 1.83–10.54).

Clinical Implications—Withholding or delaying GCTs until depression or anxiety have been treated may not be the optimal treatment course given the benefits of reduced levels of distress after undergoing these interventions.

Strengths & Limitations—Strengths include the well-defined sampling frame, which allowed correcting for non-response, a sample with approximately equal numbers of TF and TM participants, and the ability to combine data on HT and GCS. Limitations include the cross-sectional design and the fact that participants may not be representative of the transgender population in the US.

Conclusion—Body-gender congruence and body image satisfaction were higher, and depression and anxiety were lower among individuals who had more extensive GCTs compared to those who have received less treatment or no treatment at all.

Keywords

Transgender; gender confirmation treatments; mental health; body image

INTRODUCTION

Transgender is a term used to describe individuals whose gender identity differs from the male or female sex designation usually occurring at birth.[1, 2] A person whose gender identity differs from a female sex designation is referred to as female-to-male or

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transmasculine (TM) and a person whose gender identity differs from a male sex designation is referred to as male-to-female or transfeminine (TF). The terms TM/TF include a broad spectrum of identities that differ from the gender assigned at birth and can apply to individuals who do not identify with binary categories.[3]

Some transgender individuals experience gender dysphoria (GD), defined as a feeling of distress resulting from the incongruence between physical appearance and gender identity.[4, 5] This distress, compounded by commonplace experiences of stigma, victimization and discrimination, may partly explain the disproportionately high rates of depression and anxiety among TM and TF individuals compared with the general population.[6–8] These mental health issues not only affect an individual's quality of life but are associated with other health problems and higher mortality rates.[9–12] Among transgender individuals, depression has been linked to substance abuse, high risk sexual behaviors, and most notably, suicide.[13–15]

Transgender individuals may seek medical gender confirmation treatments (GCTs), including administration of hormone therapy (HT) to achieve desired masculinization or feminization, and/or surgical change of the genitalia and other secondary sex characteristics. HT may include estrogens for TF and testosterone for TM individuals. Examples of gender confirmation surgeries (GCS) include breast augmentation and vaginoplasty for TF individuals and mastectomy and hysterectomy for TM individuals.[16] Historically, individuals seeking these interventions receive HT first and may choose to undergo surgeries later, after 12 months of continuous HT[17], although not all individuals follow this sequence.

Given that one source of GD is the incongruence between the physical body and gender identity, it follows that medical interventions that alter the body to be more compatible with one's identity could ameliorate this distress. Lindgren and Pauly, the first to explore the effectiveness of GD treatment, found that after HT and/or GCS, body dissatisfaction levels were reduced in both TF and TM study participants.[18, 19] More recent studies have provided additional support that both HT and GCS can decrease the level of overall body dissatisfaction[20, 21] and/or increase body satisfaction.[22] Similarly, a recent systematic review suggests that HT may lead to improvements in psychological functioning, including reductions in depression and anxiety.[23]

Although these studies offer insights regarding the associations between GCTs and body dissatisfaction/body image, depression and anxiety, they have been limited by several factors. First, the sample sizes were relatively small (22 to 162 participants) and each was based at a single clinical site.[16, 18, 21, 22, 24, 25] Second, data have rarely been presented separately for both TM *and* TF individuals, thus obscuring differences that may exist between these distinct populations.[20] Third, most studies have focused on HT *or* GCS (or assessed HT and GCS together) rather than examining the extent to which individuals at different stages of medical GCT may differ with respect to experiences of body-gender incongruence, body image satisfaction, depression and anxiety.

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With these considerations in mind, the aim of the present study was to examine the degree to which body-gender congruence, body image satisfaction, depression and anxiety differed by GCT groups among TM and TF individuals.

MATERIALS AND METHODS

Study population

The present study is based upon the cohort of participants used in the "Study of Transition, Outcomes & Gender (STRONG)." This cohort was recruited from XXX Health Plans located in Georgia (XXX), Northern California (XXX) and Southern California (XXX). The primary goal of STRONG is to assess morbidity among transgender and gender nonconforming individuals overall and among TM/TF subgroups. The three participating XXX health plans are integrated health care systems that currently provide comprehensive health services to approximately 8 million members. Enrollees are socio-demographically diverse and broadly representative of the communities in the corresponding areas.[26]

The study was conducted in partnership with XXX University, which served as the coordinating center. All activities were reviewed and approved by the Institutional Review Boards (IRB) of the four participating institutions. The three XXX organizations use similar electronic medical record (EMR) systems, and have comparably organized databases with identical variable names, formats, and specifications across sites.

The methods of cohort ascertainment were described in detail previously.[27, 28] Briefly, EMR data pertaining to all participating health plan members of all ages enrolled between January 1, 2006 and December 31, 2014 were used to identify two types of evidence supporting transgender/gender non-conforming status: 1) relevant International Classification of Diseases, Ninth Edition (ICD-9) codes; and 2) presence of specific keywords in free-text notes. Eligibility status was independently verified by two trained reviewers with disagreements adjudicated by a committee that included the project manager and two investigators.

Survey recruitment

The survey eligibility criteria included: age 18 years or older, current enrollment in one of the participating health plans, at least one relevant ICD-9 diagnostic code, and text string-confirmed transgender status. Participants were excluded from the survey if their ICD codes and text strings were limited to mental health records, their XXX physicians did not provide consent for initiating the contact, or in their responses to the screening questions, their gender identity was the same as natal sex. All initial invitations were sent via regular mail. The letter included a website and a unique password linked to the Study ID; participants were asked to read and electronically sign the consent form online prior to survey completion. Subjects who did not respond to the initial invitation were sent up to two reminders.

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Survey goal and content

As not all data elements of interest could be ascertained from the EMR data alone, the project also included a cross-sectional survey which collected self-report data via an online survey software tool or by paper for those who did not want/were not able to complete the survey on the internet.

Gender identity (TM and TF status) was determined based on a two-step question: first inquiring about participants' natal (assigned at birth) sex and then asking about their current gender identity. If the gender identity was different from the natal female sex the participant was considered TM; if the gender identity was different from the natal male sex, the participant was considered TF. Five persons who reported being born with intersex conditions were excluded from the current analysis.

GCTs received were determined by asking participants about past, current and planned HT and their history of GCS. Based on reported history of these GCTs, each participant was placed in one of the following five ordered categories: 1) no gender confirmation therapy to date; 2) HT only; 3) Top surgery (e.g., mastectomy or breast augmentation); 4) Partial bottom surgery (e.g., hysterectomy without vaginectomy or orchiectomy without vaginoplasty); and 5) Definitive bottom surgery (e.g., vaginectomy or vaginoplasty). These categories were ordered in this way based on the level of medical intervention involved (e.g., hormone therapy was considered the least extensive intervention, followed by top surgeries, which typically require one clinician referral; bottom surgeries were considered the most extensive medical interventions, as they are more medically complex procedures, have a higher risk of surgical complications and typically require two clinician referrals).[29] Although nearly all participants who underwent top or bottom surgery also reported receiving hormones, a history of HT was not required in order for an individual to be classified in a subsequent category. The five-category GCT status was used as the main independent variable of interest. Participants were also asked about their history of procedures aimed at changing secondary sex characteristics such as laryngeal shave, facial feminization, and electrolysis.

Body-gender congruence was measured using the Transgender Congruence Scale (TCS), a validated 15-item instrument aimed at measuring a transgender person's level of comfort with gender identity.[30] Body image satisfaction was measured using the body attractiveness subscale of the previously validated Revised Physical Self-Perception Profile.[31] Information about the participants' depression and anxiety levels was collected using the 10-item Center for Epidemiologic Studies Depression (CESD-10) scale and the Beck Anxiety Index (BAI), respectively.[32, 33] For TCS and body image, the binary outcome of interest was defined as the total score being less than the overall study population median value. For depression and anxiety, the binary outcome was defined using the previously proposed clinically relevant cutoffs of 10 for CESD-10, and 21 for BAI.[32, 34]

Data analyses

The objectives of these analyses were to compare body-gender congruence, body image satisfaction, and levels of depression, and anxiety across categories of subjects at different

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stages of GCT. The distributions of dependent variables of interest were compared across GCT categories by calculating category-specific median and interquartile range (IQR) values. The differences in the distributions were examined using Kruskall-Wallis tests separately for TM and TF participants.

Multivariable logistic regression models were used to examine the association between GCT categories and each outcome of interest. The covariates in the model included age, study site, race/ethnicity, TM/TF status, and receipt of procedures for changing secondary sex characteristics (e.g., laryngeal shave or facial electrolysis for TF and "facial masculinization" for TM).

To address the effect of survey non-response on study results, each logistic regression analysis was replicated using weighted models. The weights for the models represented inverse selection probabilities. The selection probabilities were obtained from a separate logistic model, which included all STRONG cohort members who were invited to participate in the survey. The binary dependent variable in this model was response to the survey and independent variables included age, TM/TF status, race/ethnicity, study site and receipt of HT and GCS.

The results of both weighted and unweighted multivariable analyses were expressed as adjusted prevalence ratios (PR) and corresponding 95% confidence intervals (CI) using the 'rlogist' procedure in the SAS-callable SUDAAN® statistical software package (RTI International, Research Triangle Park, NC).

RESULTS

Of the 2,136 individuals invited to participate, 697 subjects (33%) completed the survey: 347 were TM and 350 were TF individuals. TM respondents were younger than their TF counterparts (73% vs. 35% under the age of 40 years, Table 1). More than half of survey respondents (55% of TM and 57% of TF respondents) were non-Hispanic Whites. The proportion of Hispanics (19%) was similar to that reported in the overall cohort, but the proportions of Blacks and Asians were lower (3% and 7% respectively) than in the EMR-based study. Only 4% of survey respondents (n=28) had no history of GCT and approximately one-third (n=234) received HT without any surgery. Top surgery category included 41% of TM subjects, but only 8% of TF participants. By contrast, definitive bottom surgery was more common among TF (33%) compared to TM (11%) study subjects. Only 7 individuals reported receiving surgery but not HT; most of those were TM who underwent top surgery. Receipt of procedures aimed and changing secondary sex characteristics was reported in 11.5% of participants (1.2 % of TM and 21.7% of TF individuals).

Table 2 compares the distributions of the four dependent variables of interest: total TCS score, body image satisfaction score, CESD-10 depression score, and BAI anxiety score by TM/TF status and by GCT category. As the extent of GCTs increased (from no treatment to definitive bottom surgery), the TCS and body image satisfaction scores also increased (i.e., were more favorable), with no appreciable difference between TM and TF participants. The

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results were generally similar in the analyses that examined distributions of the CESD-10 and BAI scores.

The bivariate associations were similar to the results obtained in the multivariable logistic regression analyses. There was no evidence of an important multiplicative interaction between gender identity and GCT, and for this reason all models include TM/TF status as a covariate.

The association of GCTs with the outcomes of interest was evident in all models, but particularly pronounced for the TCS score. The proportion of participants with low (below median) TCS scores was nearly four times higher in the "no reported treatment" category (PR=3.96, 95% CI 2.72–5.75) compared to the "definitive bottom" surgery group (Table 3). The overall patterns were similar, but the PR estimates were of lower magnitude, in the regression models that assessed body image satisfaction (Table 3). In the analyses of the CESD-10 score (Table 4) the PR for moderate/severe depression (>10 points) comparing participants who reported no treatment relative to those who had definitive surgery was 1.94 (95% CI: 1.42–2.66). The corresponding PR for clinically significant anxiety (BAI >21 points) was 4.33 (95% CI 1.83–10.54; Table 4). Procedures used to change secondary sex characteristics were not associated with TCS scores, body image satisfaction, depression or anxiety (Tables 3–4). The results of the weighted models adjusting for non-response were generally similar to those of the main analyses (Tables 3–4).

DISCUSSION

For both TM and TF participants, body-gender congruence and body image satisfaction were higher among individuals who had more extensive GCT compared to those who have received less treatment or no treatment at all. These findings are consistent with previous evidence that HT[20] and GCS[21, 22, 24] lead to improved body satisfaction among transgender individuals. This result is consistent with our understanding of GD in that one of the roots of GD is a high level of body image dissatisfaction[35] and this distress may be alleviated by receiving interventions that result in a more closely-aligned physical body with gender identity. GCTs may also increase one's confidence in passing as a member of the preferred gender. For example, TM taking testosterone experience a redistribution of fat, increased muscle mass and a deepened voice, which promotes a more masculine appearance; similarly, TF individuals taking estrogens and antiandrogens experience reduced facial hair growth, an increase in fat deposits around the hips and buttocks, breast growth and reduced muscle mass, which promotes a more feminine appearance.[36] Previous research has underscored the importance of social "passing" for positive body image and body satisfaction and feelings of "passing" have been associated with a higher quality of life and self-esteem.[37]

Evidence suggests that in addition to exacerbating symptoms of GD, body image dissatisfaction can lead to secondary health problems among transgender individuals. For example, a study conducted among German, Swiss and Austrian participants showed that TM individuals displayed higher degrees of restrained eating patterns, weight and shape concerns, body dissatisfaction, and body checking (e.g., frequent weighing, looking in the

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mirror, pinching the stomach, waist, thighs or arms, etc.) than male controls: TF individuals showed more restrained eating, bulimic behavior, and body checking than male controls, and higher degrees of weight and shape concerns, body image dissatisfaction, and body checking than female controls.[38] Body dissatisfaction and poor body image can also predispose individuals to chronic depression, substance use/abuse, and several affective spectrum and somatic disorders.[39] Clearly, body dissatisfaction can lead to significant morbidities in this population and thus interventions that reduce risk for these conditions, such as GCTs, warrant serious consideration.

Our results also indicate that depression, and especially anxiety, were lower among individuals who received a more extensive GCTs compared to those who received less treatment or no treatment at all. These findings are consistent with and extend results from previous studies that have similarly reported that HT and GCS can result in lower levels of depression and anxiety.[16, 40–42] Historically, standard clinical practice has been to first treat any comorbid psychological conditions such as depression and anxiety prior to referring a transgender individual for GCTs.[43] As medical GCTs can be both physically and psychologically taxing[40] individuals with well-managed mental health issues may be best prepared to undergo this treatment. On the other hand, withholding HT or GCS until depression or anxiety have been treated may not be the optimal treatment course given the benefits of reduced levels of distress after undergoing GCT. The more recent clinical guidelines such as the World Professional Association for Transgender Health (WPATH) Standards of Care now recognize that HT may improve overall mental health status.[29] Given the alarmingly high rates of suicide attempts among transgender populations[7, 44–46] and recent evidence suggesting that suicide attempt rates decrease after GCS, [47] it is critical to consider all possible interventions with the potential to ameliorate psychological distress in this population. Healthcare providers must balance these potential benefits against possible adverse events related to HT (e.g., thromboembolism) and GCS (e.g., infections or other complications) as well as patient preferences/values and the availability/affordability of treatments.

Health insurance coverage for GCTs, particularly surgery, remains an area of controversy. For example, in 2016 the Centers for Medicare and Medicaid Services (CMS) announced the decision to not issue a National Coverage Determination on gender reassignment surgery for Medicare beneficiaries with GD because the clinical evidence was deemed inconclusive. In its decision memo, the CMS indicated that it "encourages robust clinical studies that will fill the evidence gaps and help inform which patients are most likely to achieve improved health outcomes with gender reassignment surgery, which types of surgery are most appropriate, and what types of physician criteria and care setting(s) are needed to ensure that patients achieve improved health outcomes."[48] Findings from this study indicate that GCTs may be particularly beneficial for psychosocial conditions. However, additional research is needed to ascertain the benefits and harms of these interventions. Of particular concern are the effects on different subgroups such as those with more severe pre-existing psychiatric illness and individuals with varying levels of social support.

Several limitations of the present study should be recognized. The cross-sectional design of the survey does not allow for causal inferences with respect to the association between stage

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of GCT and body-gender congruence, body image satisfaction, depression, and anxiety. For example, individuals who are less depressed/anxious could be more likely to seek GCTs than those who are more depressed/anxious. However, a recent prospective study reported that, over the course of HT, participants with gender dysphoria reported significant reductions in general psychopathology and depressive symptoms, providing some evidence for the temporal association between GCTs and improvements in mental health-related outcomes.[49] The current study sample included only a small proportion of individuals who received no GCTs at all. These individuals were underrepresented because of the IRB requirement that eligible subjects had to have both a diagnostic code and a text string-confirmed transgender status, and could not receive transgender care exclusively from mental health providers. Additional prospective studies with large sample sizes and longer follow-up periods are needed to assess these constructs before and after receipt of GCTs. We also recognize that transgender individuals enrolled through integrated health care systems such as KP represent a cohort of individuals with health insurance that may not be representative of the transgender population in the US. It is expected that some of the results may differ among transgender individuals from different socioeconomic strata. Weighing against this concern is the demonstrated ability to cost-effectively identify a large cohort of transgender subjects with a high degree of internal validity. The availability of the well-defined sampling frame and extensive data on both respondents and non-respondents permitted quantitative adjustment for selection bias. Further, the present study, in contrast to prior research, included approximately equal numbers of TF and TM participants, which allowed us to examine differences and similarities of these two populations. The ability to combine data on HT and GCS allowed us to investigate the extent to which individuals *at different stages of GCT* may differ with respect to experiences of body-gender congruence, body image satisfaction, depression and anxiety.

CONCLUSIONS

In sum, results from the present study provide evidence for an association between participants' stage of GCT and their perceived body-gender incongruence and body image satisfaction as well as their symptoms of depression and anxiety. These findings were consistent for both TM and TF participants. Future research is needed to assess the temporal association between GCTs and psychosocial outcomes employing robust study designs, including larger-scale longitudinal cohort studies, and utilizing standardized scales and clinician-delivered mental health outcome measures in order to facilitate inferences and draw more definitive conclusions.

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Table 1

Characteristics of the STRONG survey participants

Participant characteristics	All subjects	Transmasculine	Transfeminine
	n (col %)	n (col %)	n (col %)
Total, n (row %)	697 (100.0)	347 (50.0)	350 (50.0)
Age at time of survey			
18–29	217 (31.1)	148 (42.7)	69 (19.7)
30–39	157 (22.5)	105 (30.3)	52 (14.9)
40–54	168 (24.1)	69 (19.9)	99 (28.3)
55 or older	155 (22.2)	25 (7.2)	130 (37.1)
Presents as a woman			
Never	330 (47.3)	310 (89.3)	20 (5.7)
Part-time	67 (9.6)	22 (6.3)	45 (12.9)
Full-time	273 (39.2)	5 (1.4)	268 (76.6)
Declined to respond	27 (3.9)	10 (2.9)	17 (4.9)
Presents as a man			
Never	277 (39.7)	16 (4.6)	261 (74.6)
Part-time	63 (9.0)	22 (6.3)	41 (11.7)
Full-time	323 (46.3)	297 (85.6)	26 (7.4)
Declined to respond	34 (4.9)	12 (3.5)	22 (6.3)
Race/ethnicity			
Non-Hispanic Whites	392 (56.2)	191 (55.0)	201 (57.4)
Non-Hispanic Blacks	20 (2.9)	13 (3.7)	7 (2.0)
Asian/Pacific islanders	48 (6.9)	25 (7.2)	23 (6.6)
Hispanics	133 (19.1)	68 (19.6)	65 (18.6)
Mixed race/ethnicity	18 (2.6)	8 (2.3)	10 (2.9)
“Other” race/ethnicity	49 (7.0)	27 (7.8)	22 (6.3)
Declined to respond	37 (5.3)	15 (4.3)	22 (6.3)
Education			
High school graduate or less	74 (10.6)	45 (13.0)	29 (8.3)

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Participant characteristics	All subjects	Transmasculine	Transfeminine
	n (col %)	n (col %)	n (col %)
At least some college	242 (34.7)	100 (28.8)	142 (40.6)
College graduate	197 (28.3)	104 (30.0)	93 (26.6)
Graduate/professional school	150 (21.5)	81 (23.3)	69 (19.7)
Declined to respond	34 (4.9)	17 (4.9)	17 (4.9)
Individual income			
Less than $25,000	127 (18.2)	69 (19.9)	58 (16.6)
$25,000 – $49,999	138 (19.8)	65 (18.7)	73 (20.9)
$50,000 – $74,999	120 (17.2)	65 (18.7)	55 (15.7)
$75,000 – $99,999	93 (13.3)	47 (13.5)	46 (13.1)
Greater than $100,000	128 (18.4)	51 (14.7)	77 (22.0)
Prefer not to answer or unsure	91 (13.1)	50 (14.4)	41 (11.7)
History of GCT [a]			
No GCT	28 (4.0)	11 (3.2)	17 (4.9)
HT only	234 (33.6)	76 (21.9)	158 (45.1)
Top surgery	171 (24.5)	142 (40.9)	29 (8.3)
Partial bottom surgery	80 (11.5)	64 (18.4)	16 (4.6)
Definitive bottom surgery	153 (22.0)	39 (11.2)	114 (32.6)
Missing information	31 (4.4)	15 (4.3)	16 (4.6)
Procedures to change secondary sex characteristics			
Yes	80 (11.5)	4 (1.2)	76 (21.7)
No	617 (88.5)	343 (98.8)	274 (78.3)

[a]Only 7 individuals reported receiving surgery but not HT. Most of those were TM who underwent top surgery.

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Table 2

The distributions of outcome measures by transgender status and by gender confirmation category

Outcome measure by gender confirmation category	Transmasculine			Transfeminine		
	Median	IQR[e]	p-value[f]	Median	IQR[e]	p-value[f]
Transgender congruence score[a]						
No treatment	30	22–36	<0.0001	30	25–46	<0.0001
HT only	43	32–51		44	33–50	
Top surgery	50	44–56		44	39–52	
Partial bottom surgery	49	42–55		51	37–57	
Definitive bottom surgery	55	49–59		53	48–57	
Body image satisfaction score[b]						
No treatment	9	9–16	<0.0001	11	6–18	0.0065
HT only	12	7–18		15	10–20	
Top surgery	17	12–22		12	9–19	
Partial bottom surgery	15	9–18		14	10–22	
Definitive bottom surgery	16	13–21		18	13–22	
CESD-10 depression score[c]						
No treatment	16	13–23	0.0016	14	10–21	0.0002
HT only	12	8–18		10	5–16	
Top surgery	8	4–13		11	6–16	
Partial bottom surgery	9	4–15		8	3–16	
Definitive bottom surgery	6	3–14		6	3–11	
BAI anxiety score[d]						
No treatment	25	16–26	0.0006	12	7–25	0.0015
HT only	12	7–26		9	2–17	
Top surgery	7	4–17		7	3–13	
Partial bottom surgery	9	2–17		9	3–13	
Definitive bottom surgery	5	2–13		5	1–10	

[a]Composite of 12 questions, possible range: 12–60; higher scores indicate greater level of comfort with gender identity.

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[b]Composite of 5 questions, possible range: 5–25; higher scores indicate a higher level of body image satisfaction.

[c]Composite of 10 questions, possible range: 0–30; higher scores indicate higher levels of depression.

[d]Composite of 21 questions, possible range: 0–63; higher scores indicate higher levels of anxiety.

[e]Interquartile range

[f]Kruskal-Wallis test

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Table 3

Associations of gender confirmation, gender identity, and procedures aimed at changing secondary sex characteristics with low transgender congruence and body image scores

Variables of interest	Total N	N (%) within treatment category	Unweighted analyses			Weighted analyses		
			PR[a]	95% CI[b]		PR[a]	95% CI[b]	
Transgender congruence score below median[c]								
Gender confirmation category								
Definitive bottom surgery	149	33 (22%)	1.00	(reference)		1.00	(reference)	
Partial bottom surgery	77	34 (44%)	2.11	1.38	3.23	2.15	1.37	3.37
Top surgery	161	71 (44%)	2.06	1.39	3.05	2.10	1.39	3.17
HT only	210	138 (66%)	3.03	2.14	4.30	3.22	2.25	4.61
No treatment	27	23 (85%)	3.96	2.72	5.75	3.66	2.28	5.88
Gender identity								
Transfeminine	306	150 (49%)	1.00	(reference)		1.00	(reference)	
Transmasculine	318	149 (47%)	0.95	0.77	1.15	1.03	0.83	1.28
Changes in secondary sex characteristics								
Yes	75	30 (40%)	1.00	(reference)		1.00	(reference)	
No	549	269 (49%)	0.88	0.68	1.12	0.87	0.68	1.13
Body image score below median[d]								
Gender confirmation category								
Definitive bottom surgery	150	49 (33%)	1.00	(reference)		1.00	(reference)	
Partial bottom surgery	79	39 (49%)	1.42	1.01	2.01	1.58	1.10	2.26
Top surgery	167	67 (40%)	1.19	0.85	1.65	1.25	0.88	1.78
HT only	220	116 (53%)	1.59	1.20	2.10	1.72	1.27	2.32
No treatment	28	17 (61%)	1.81	1.22	2.68	1.75	1.08	2.83
Gender identity								
Transfeminine	319	139 (44%)	1.00	(reference)			(reference)	
Transmasculine	325	149 (46%)	1.09	0.88	1.36	1.11	0.88	1.39
Procedures to change secondary sex characteristics								

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Variables of interest	Total N	N (%) within treatment category	Unweighted analyses			Weighted analyses		
			PR[a]	95% CI[b]		PR[a]	95% CI[b]	
Yes	77	24 (31%)	1.00	(reference)			(reference)	
No	567	264 (47%)	1.24	0.87	1.76	1.29	0.87	1.90

[a]PR, prevalence ratio adjusted for age, race, study site, and all variables listed in the table.

[b]CI, confidence interval

[c]Model based on 624 observations

[d]Model based on 644 observations

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Table 4

Associations of gender confirmation, gender identity, and procedures aimed at changing secondary sex characteristics with high CESD-10 depression and anxiety scores

Variables of interest	Total N	N (%) within treatment category	Unweighted analyses			Weighted analyses		
			PR[a]	95% CI[b]		PR[a]	95% CI[b]	
CESD-10 score above 10[c]								
Gender confirmation category								
Definitive bottom surgery	141	50 (35%)	1.00	(reference)		1.00	(reference)	
Partial bottom surgery	75	34 (45%)	1.19	0.84	1.67	1.18	0.84	1.68
Top surgery	158	66 (42%)	1.00	0.73	1.38	0.96	0.69	1.34
HT only	198	113 (57%)	1.40	1.07	1.83	1.38	1.05	1.81
No treatment	26	20 (77%)	1.94	1.42	2.66	2.01	1.51	2.68
Gender identity								
Transfeminine	293	139 (47%)	1.00	(reference)			(reference)	
Transmasculine	305	144 (47%)	0.92	0.74	1.15	0.91	0.73	1.12
Changes in secondary sex characteristics								
Yes	71	30 (42%)	1.00	(reference)			(reference)	
No	527	253 (48%)	0.91	0.69	1.18	0.93	0.72	1.21
Anxiety score above 21[d]								
Gender confirmation category								
Definitive bottom surgery	139	8 (5.8%)	1.00	(reference)		1.00	(reference)	
Partial bottom surgery	73	13 (18%)	1.93	0.82	4.53	1.41	0.57	3.46
Top surgery	159	34 (22%)	1.90	0.86	4.18	1.51	0.68	3.37
HT only	195	47 (24%)	2.59	1.21	5.54	2.15	1.02	4.51
No treatment	26	11 (42%)	4.33	1.83	10.54	2.74	1.10	6.80
Gender identity								
Transfeminine	296	42 (14%)	1.00	(reference)		1.00	(reference)	
Transmasculine	296	71 (24%)	1.26	0.81	1.94	1.38	0.87	2.20
Procedures to change secondary sex characteristics								

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Variables of interest	Total N	N (%) within treatment category	Unweighted analyses			Weighted analyses		
			PR[a]	95% CI[b]		PR[a]	95% CI[b]	
Yes	72	6 (8.3%)	1.00	(reference)		1.00	(reference)	
No	520	107 (21%)	1.00	0.48	2.11	1.05	0.49	2.25

[a]PR, prevalence ratio adjusted for age, race, study site, and all variables listed in the table.

[b]CI, confidence interval

[c]Model based on 598 observations

[d]Model based on 592 observations